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IN
DILATATION OF THE HEART

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OF MARYLAND

presented by the author

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It is probable that many members of this Society are familiar with the admirable article of Professor Thomas R. Fraser, of Edinburgh, on the action and uses of strophanthus in cardiac affections, which was published in *The British Medical Journal*, in November, 1885. The article is deserving of the highest commendation for the careful way in which the observations reported were made, and the clear reasoning from those observations which it shows.

As some present may not have seen the paper, I may be permitted to refer briefly to its leading points before speaking of the use which, under its guidance, I have myself made of strophanthus in the case which I purpose to report here, and which was one of the first in which the drug was employed in America.

The strophanthus is an African plant, found both on the western coast of the continent of Africa, in Senegam-

¹ A paper read before the Clinical Society of Baltimore.



bia and Guinea, and on the eastern coast along the Zambezi River. It is endowed with very active properties, for which it is used by the native tribes as an arrow poison both in hunting and in war. The poison is said to be prepared from the seeds of the plant, which are formed into a paste for this purpose. These seeds contain a crystalline principle, soluble in water and in rectified spirit, with a strongly bitter taste, and not alkaloidal in character. This is found also in the leaves and bark of the plant, but in less amount than in the seeds. This principle Professor Fraser terms strophanthin. In its action upon the frog's heart strophanthus is synergistic with digitalis, increasing the strength of its contractions, more especially the contraction of the ventricle; and, when a sufficient amount is applied, producing a strong or even tetanic contraction of the ventricle, so that the heart ceases to act in extreme systole. It is asserted by Dr. Fraser that the strophanthus in like manner increases the contractile power of all striped muscles, rendering their contractions more complete and prolonged; but that the heart is more distinctly and powerfully affected than other muscles, because it receives a larger quantity of blood than others do. But while the strophanthus is like digitalis in this action, it is very much more powerful than that drug. Some experiments of Dr. Fraser on this point show that a solution of strophanthin of one part in 10,000,000 produces a ventricular contraction of a frog's heart greater in energy than that caused by a solution of digitalin of one part in 4,000; for the digitalin solution while producing the usual changes in the heart's action, *i.e.*, increasing its contractile force and slowing it, does not arrest it; but strophanthin solution stops it in extreme systole. The difference in the power of the two agents, as thus shown, is very striking. But another difference between them, and one that may be equally important from a therapeutic point of view, is this: that whereas digitalis by an action on the blood-vessels themselves, distinct from its influence on the heart, causes increased tension and

resistance in these vessels, strophanthus, on the other hand, does not act in this way, except to a very slight degree, if at all. Here again the contrast in the action of the two drugs was well shown by experiment. A solution of one part of digitalin in 20,000 when passed through the blood-vessels produced in a few minutes such extreme contraction of them as to prevent the solution from passing any longer. A much stronger solution of strophanthin, one part in 3,000, on the other hand, caused no noticeable change in the vessels, while only a slight and temporary action was produced by a solution of one part in 2,000.

This difference would again seem to make in favor of strophanthus as a therapeutic agent. For it would seem likely that in embarrassment and retardation of the circulation the beneficial effect gotten from the increased power which digitalis gives the heart is, to a certain extent, antagonized and lessened by the resistance which it causes in the blood-vessels. But, on the other hand, by the use of strophanthus not only may we have increase in heart-power, but all of the power thus gained, unhampered by obstruction in the arterioles, is directed against venous stasis.

These two circumstances therefore—first, more powerful action as a heart energizer, and second, non-action upon the blood-vessels—would make it probable that strophanthus is a more efficient therapeutic agent than digitalis in the treatment of cardiac dilatation and the symptoms resulting from it.

And so in the cases reported by Professor Fraser it proved to be.

The one case in which I have made use of the drug is, so far as I have yet been able to ascertain by inquiring among my professional friends, the only one in which it has been employed in this city, with the single exception of one case of later date than mine, in which Dr. I. E. Atkinson has used it, and in which, either from the ad-

vanced state of disease or unsatisfactory quality of the drug, no appreciable result was obtained from it.¹

The preparation of the drug which I have used is a tincture which was given to me by Dr. William T. Howard, to whom it was presented last summer, while he was in London, by Dr. Fraser, as a specimen made by himself. I should have used it in a number of other cases with hope of good results, but my supply of this tincture was small, and I preferred to test its value on one case as fully as was possible with the small amount at my command. In this case it has appeared to substantiate fully the claims made in its behalf by Professor Fraser.

CASE.—Ella —, aged about twenty years, came under my charge in the Hospital of the University of Maryland, in October, 1886, when I found her suffering with general cardiac dropsy. The feet and legs were considerably swollen, but the largest amount of fluid was in the abdominal cavity, which was very much distended, so that respiration was greatly embarrassed and the patient prevented from lying down. For this she had been treated with digitalis, without much benefit, and she had been twice tapped. On examination the area of cardiac dulness was much increased, the heart's impulse diffused and lessened in intensity, and a loud systolic murmur at the apex and in the scapular region showed extensive mitral insufficiency with consequent dilatation. The pulse ranged at from 112 to 120 per minute, and the amount of urine was from fourteen to sixteen ounces in the twenty-four hours. It contained no albumen. The condition of the patient indicated the use of digitalis or other agents synergistic with it; but it was evident that with the great pressure upon the abdominal viscera and upward against the diaphragm there could be no fair and satisfactory test of drugs directed therapeutically to the heart and kidneys. I accordingly tapped the girl on

¹ Dr. Atkinson has informed me since the reading of this paper that he has recently used the drug with strikingly good effect.

October 26th, drawing off more than a gallon of fluid, with the effect of relieving her extreme dyspnoea and allowing her to lie down. Two days afterward I put her upon the use of Dr. Fraser's tincture of strophanthus in the doses, at first of two drops, and after three days, of four drops, three times a day.

Now, it is clear that in endeavoring to estimate the value of any agent given under such circumstances, there is an obvious fallacy to be guarded against. An effect really due to the tapping might be erroneously ascribed to the action of the drug; for such results as ability to take the recumbent position, and an increase in the amount of urine, could be brought about by the direct withdrawal of the fluid even more readily in many cases than by the use of medicinal agents. Against this fallacy I endeavored to guard carefully. In the first place, I ascertained that after the previous tapplings, while the patient could lie down more comfortably than before, and the amount of urine was somewhat increased, yet this increase was but slight, and there was no noticeable change in the pulse either as regards diminution of its frequency or increase of its force. Prepared with this knowledge, on the second day after the tapping, October 28th, I began the use of Dr. Fraser's tincture of strophanthus in doses of two drops three times a day. In two days there was a conspicuous improvement in the patient's condition, and on the third day the dose was increased to four drops. The breathing was much easier; the recumbent position could be maintained longer; the pulse, which had pretty constantly ranged at from 112 to 120, and had not improved after the previous tapping, was reduced to 84 per minute, and increased at the same time in fulness and strength; the impulse of the heart was more forcible, and the urine was augmented in quantity from one pint or less, daily, to more than three pints. This improvement continued steadily for ten days, the patient being out of bed and walking about the ward, and expressing herself as feeling far bet-

ter in every way ; when, in order to guard more perfectly against the source of fallacy referred to, I withheld the drug. In two days the patient's breathing became more oppressed, the heart's impulse lessened in force, and the pulse rose above one hundred. She begged me to give her again the medicine from which she had experienced so much relief. Its use was followed as before by prompt mitigation of the symptoms ; and with occasional omissions that were followed by a return of these symptoms, which were again relieved by a recurrence to the medicine, she took it until my supply of Dr. Fraser's tincture was exhausted, when, being left without the medicine, she had a return of the urgent distress. I then obtained a specimen of tincture of strophanthus from a New York importing house ; but although some relief was gotten from this, yet, either from an inferior quality of the drug, or because of the more advanced and irremediable condition of the disease, the response to the medicine has become less and less, and finally has ceased to be afforded at all. The dropsy has increased in amount, the quantity of urine diminished, the heart's action has grown feebler, and the dyspnoea has become more urgent and distressing.

About one week after the reading of this paper the patient died. The post-mortem examination confirmed the diagnosis of mitral incompetency and dilatation of the heart, both of which conditions were found in an extreme degree. The amount of morbid alteration in the mitral orifice and valve was very remarkable, the two leaves of the valve being destroyed to such a degree that only two small stubs were left, so that their function must have been completely lost. The circumference of the mitral orifice was converted into a hard and rough ridge of calcareous matter, and the ventricular wall was extremely attenuated. The death of the patient under such circumstances, so far from invalidating the efficacy of the medicine, showed its power

the more clearly by revealing the great difficulty against which it had to contend, and which it for the time relieved.

Since my first use of strophanthus in this case I have employed it in others similar in character. I have also used it as a cardiac tonic in other cases of weak heart without valvular or other discoverable organic disease. In one case of double pneumonia, now convalescent, in which there was great danger from extreme feebleness and intermittence of the heart, it has been manifestly beneficial. Indeed, it has seemed to me to produce some good effect always in such conditions in the way of increasing the contractile power of the heart. Such uses of the drug are suggested by Dr. Fraser. But in no case has its efficacy been more conspicuous than it was in the one above reported, in which, nevertheless, the amount of disease was necessarily fatal.

That any response to a medicine should have been made under such circumstances, or any improvement have occurred, was remarkable; and yet over and over again, in this advanced stage of disease, the most unmistakable benefit was wrought by the strophanthus.

BALTIMORE, April 15, 1887.

